



Demand Response as a System Reliability Resource

Joseph Eto

**Consortium for Electric Reliability Technology Solutions
Lawrence Berkeley National Laboratory**

**National Town Meeting and Symposium on Demand Response
26 June 2006
Berkeley, CA**

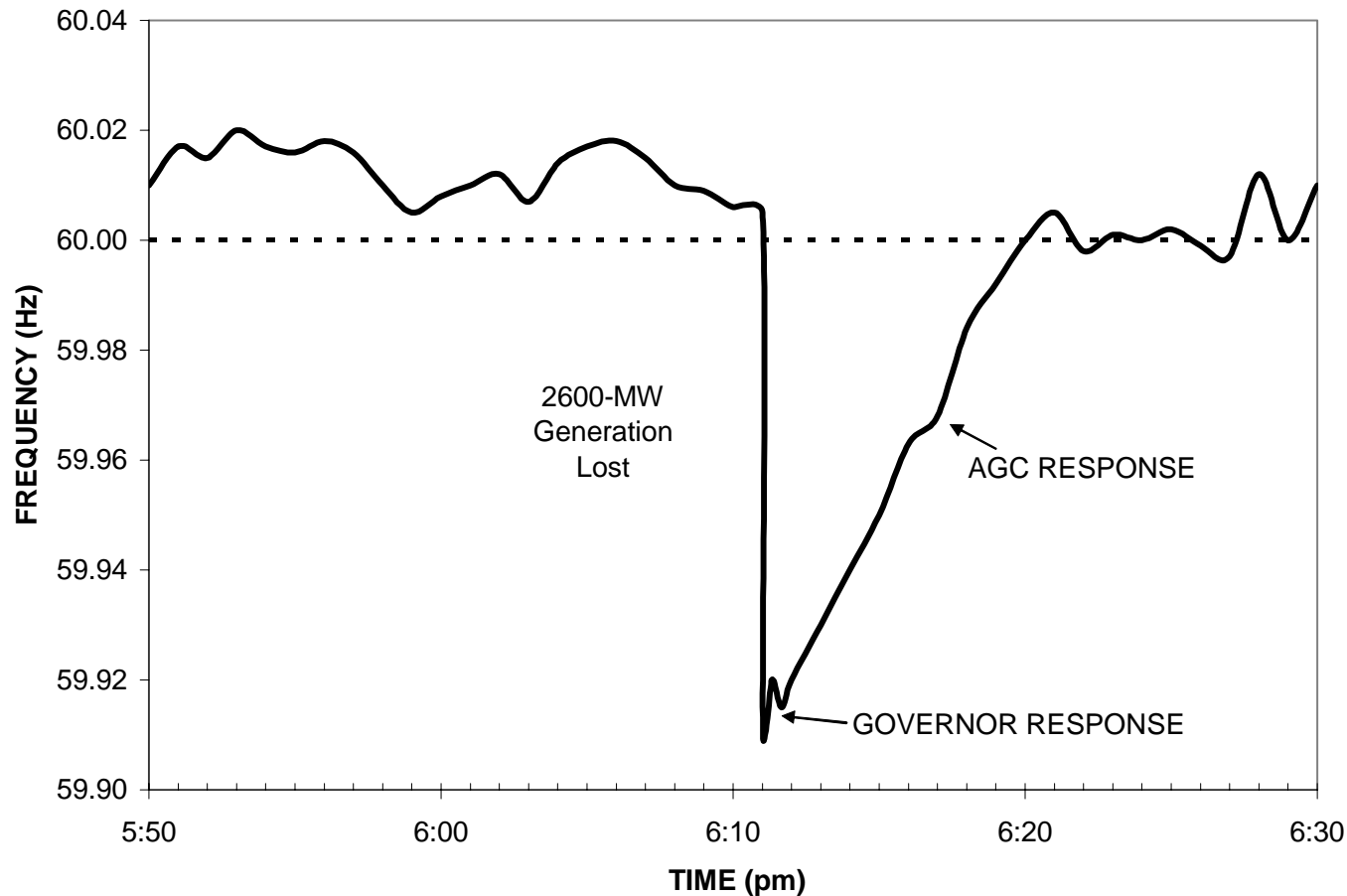


Overview and Project Rationale

- ★ CA ISO procures regulation, spinning reserve and non-spinning reserve (“ancillary services”) in the day-ahead and hour-ahead markets
 - ◆ Spinning reserve is the most expensive contingency reserve service
- ★ Certain loads, such as air conditioning, may be ideally suited to provide spinning reserve
 - ◆ A/C is often being used when spinning reserve prices are high
 - ◆ Spinning reserve curtailments are typically very short
- ★ Southern California Edison (SCE) operates one of the largest installed based of load management assets in the U.S.
 - ◆ The A/C Cycling Program, initiated in the late 1970’s, currently controls 340 MW of load
- ★ This project is evaluating the potential for re-positioning a traditional utility load management asset to become a system reliability asset that lower costs and improves the functioning of competitive wholesale electricity markets



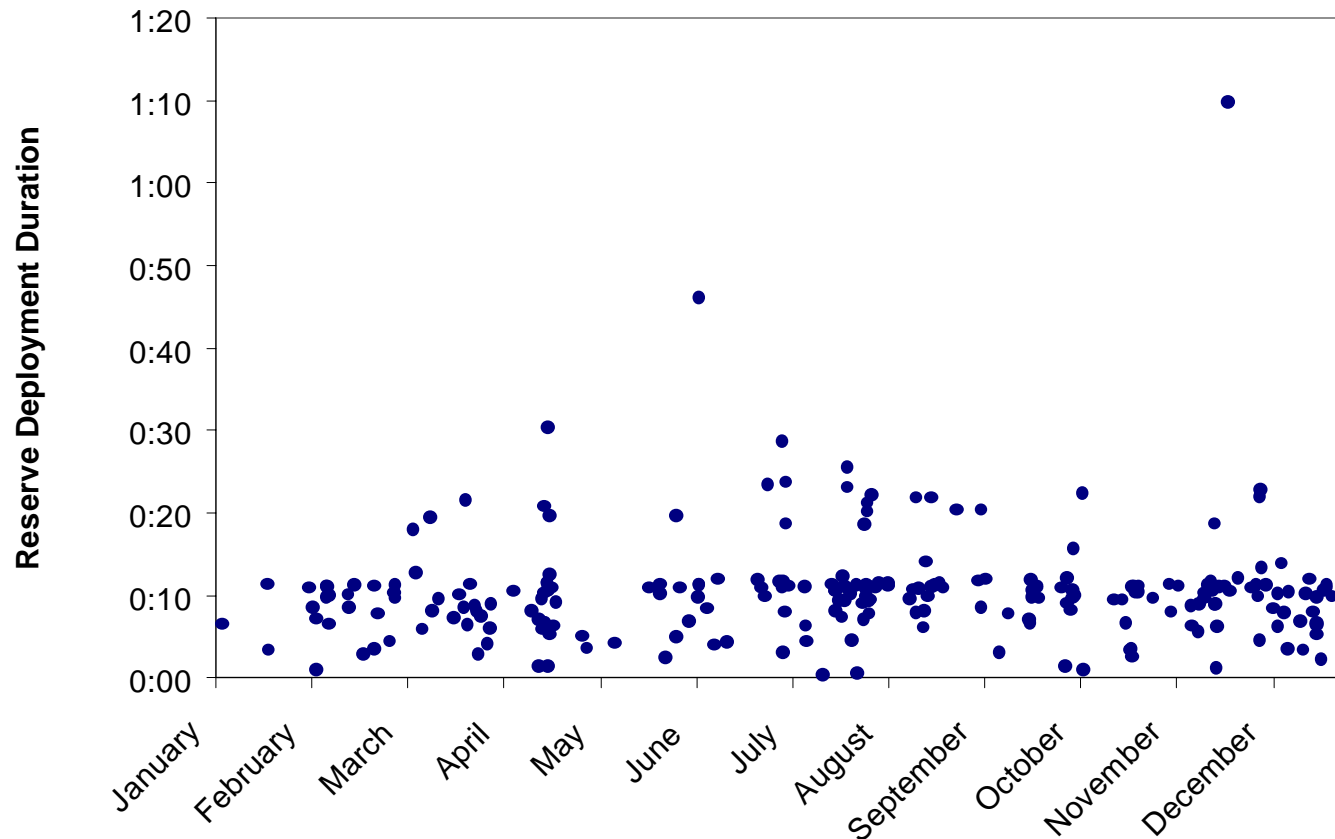
Spinning Reserves Respond Immediately Following A Contingency



Source: ERCOT



Provision of Spinning Reserve Is Well-Suited For Many Loads



The New York Independent System Operator deployed reserves 239 times in 2002 for an average of *just over 10 minutes each time*

Source: B. Kirby. Spinning Reserve From Responsive Loads. ORNL/TM-2003/19



Demand Response Technologies Could Help Prevent Energy Emergencies



Normal Operation

ISO Participating Load Program

**Stage 1 Operating
Reserves falling below 7%**

Public Alert - Voluntary Conservation

**Stage 2 Operating
Reserves falling below 5%**

Utility Interruptible Load Programs

**Stage 3 Operating
Reserves falling below 1.5%**

Curtail Firm Loads - Rolling Blackouts



Project Objectives

- ★ Demonstrate that demand response can provide spinning reserve in a manner that will be adopted by system operators
 - ◆ Build operator confidence regarding the value of demand response as an alternative to traditional approaches for providing spinning reserve
 - ◆ Establish the technical basis for modifying reliability rules to allow utilization of demand response for spinning reserve
- ★ Demonstrate and benchmark statistically the reliability of large numbers of small responsive loads
 - ◆ Compare this to the current responsiveness of generation



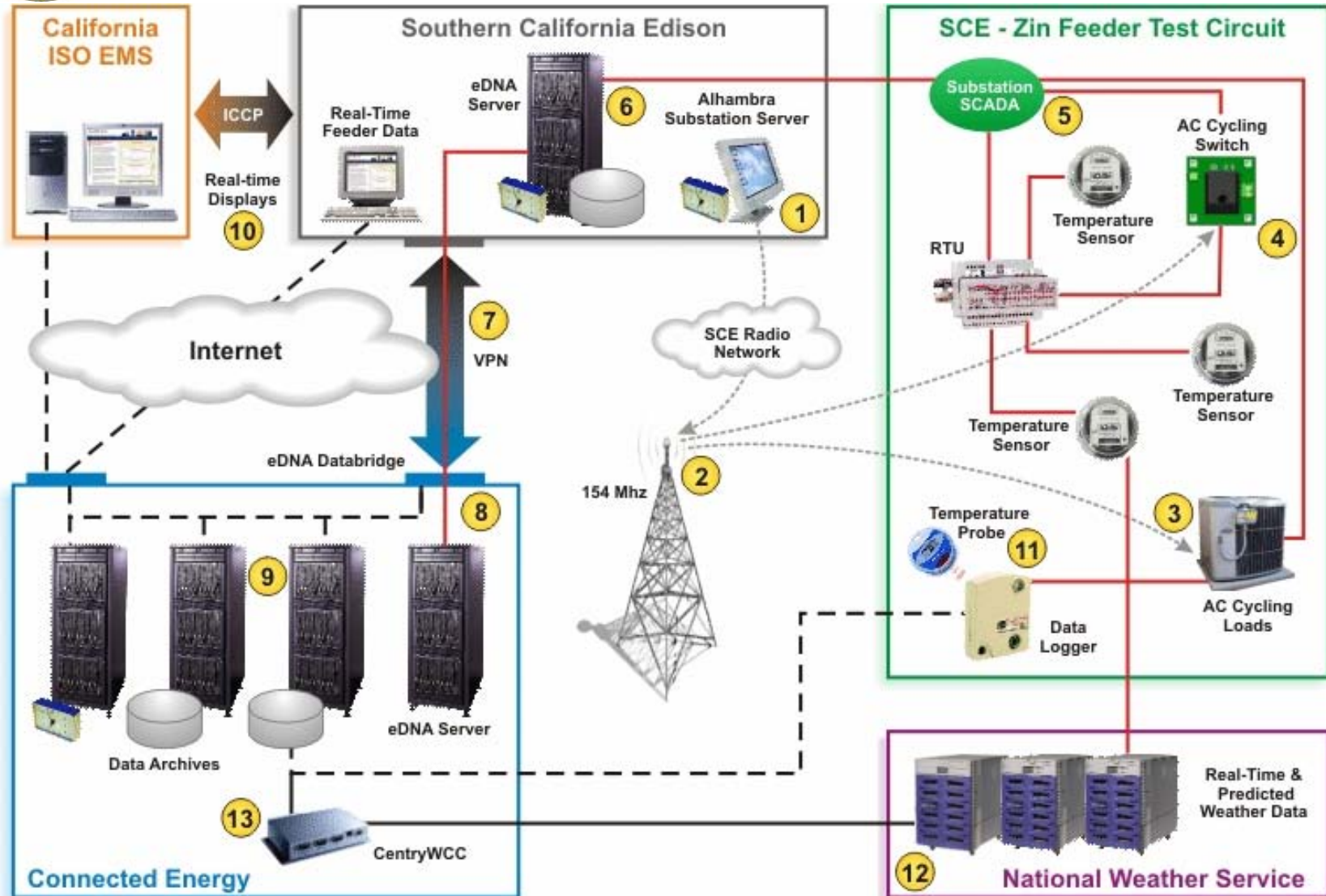
Project Plan – Stage 1



- * SCE is telemetering a *single* distribution feeder with visibility to CA ISO through a secure website
- * SCE is target marketing it's A/C load cycling program to 5-600 customers on this feeder
- * SCE will curtail these loads according to a pre-set schedule, for 5-20 min., between 2-6pm
- * Approximately 100 A/C units will have near real-time metering
- * Each step in the curtailment process will be time-stamped to measure the speed and magnitude of the demand response
- * CAISO, CA IOUs, and WECC are providing technical input into the design and review of the analysis



Project Overview





Real-time Website



CERTS
CONSORTIUM FOR ELECTRIC RELIABILITY TECHNOLOGY SOLUTIONS

[Home](#)[FAQs](#)[Test Plan](#)
(PDF)[Overview](#)
(PPT)[Team Members](#)[Topology](#)[Links](#)[Test Details](#)
(team members only)

CERTS Demand Response Demonstration

This website provides [real-time](#) and [archived](#) information from a precise, statistically significant test of demand response for a representative SCE distribution circuit ([see project overview](#)). The next test is scheduled for dynamic update.

The test is intended to demonstrate the capabilities of load management technologies to provide spinning reserve to the [California ISO](#) and to defer distribution enhancements for [SCE](#). In the test, residential air conditioning clustered within a single SCE distribution circuit is being curtailed using a dispatch signal from a central control location ([see topology](#)). Daily tests are being planned for the entire month of September.

The test has two basic goals ([see Test Plan](#)):

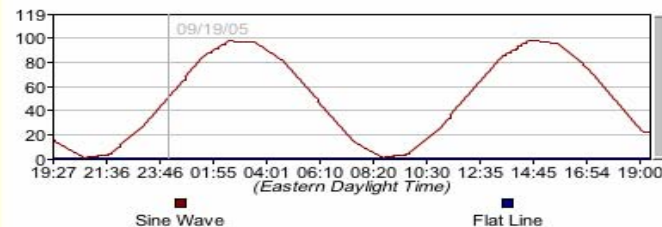
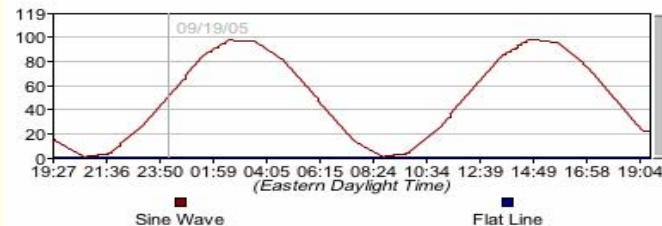
1. Demonstrate that the load can be curtailed reliably and quickly on the issuance of a dispatch signal. The load shed is expected to start within 10 seconds of the signal and be fully implemented within two minutes.
2. Demonstrate that when load is curtailed by a dispatch signal, the available MW demand response of a specific circuit can be precisely predicted with a 90% statistical confidence level using three variables: time of day, day of week, and temperature.

This project is coordinated by the [Consortium for Electric Reliability Technology Solutions](#) and the [California ISO](#) under a research grant from the CEC [PIER](#) program. Contact [John Kueck](#), Oak Ridge National Laboratory, for more information about this project. Contact [Joe Eto](#), Lawrence Berkeley National Laboratory for more information about CERTS.

Real-Time Data

Next curtailment time: **In-progress**

Current temp: °



Date	Time of curtailment	Average MW saved per home
07-26-05	8:00pm PST	12 MW

Powered By:
Connected Energy Corp.





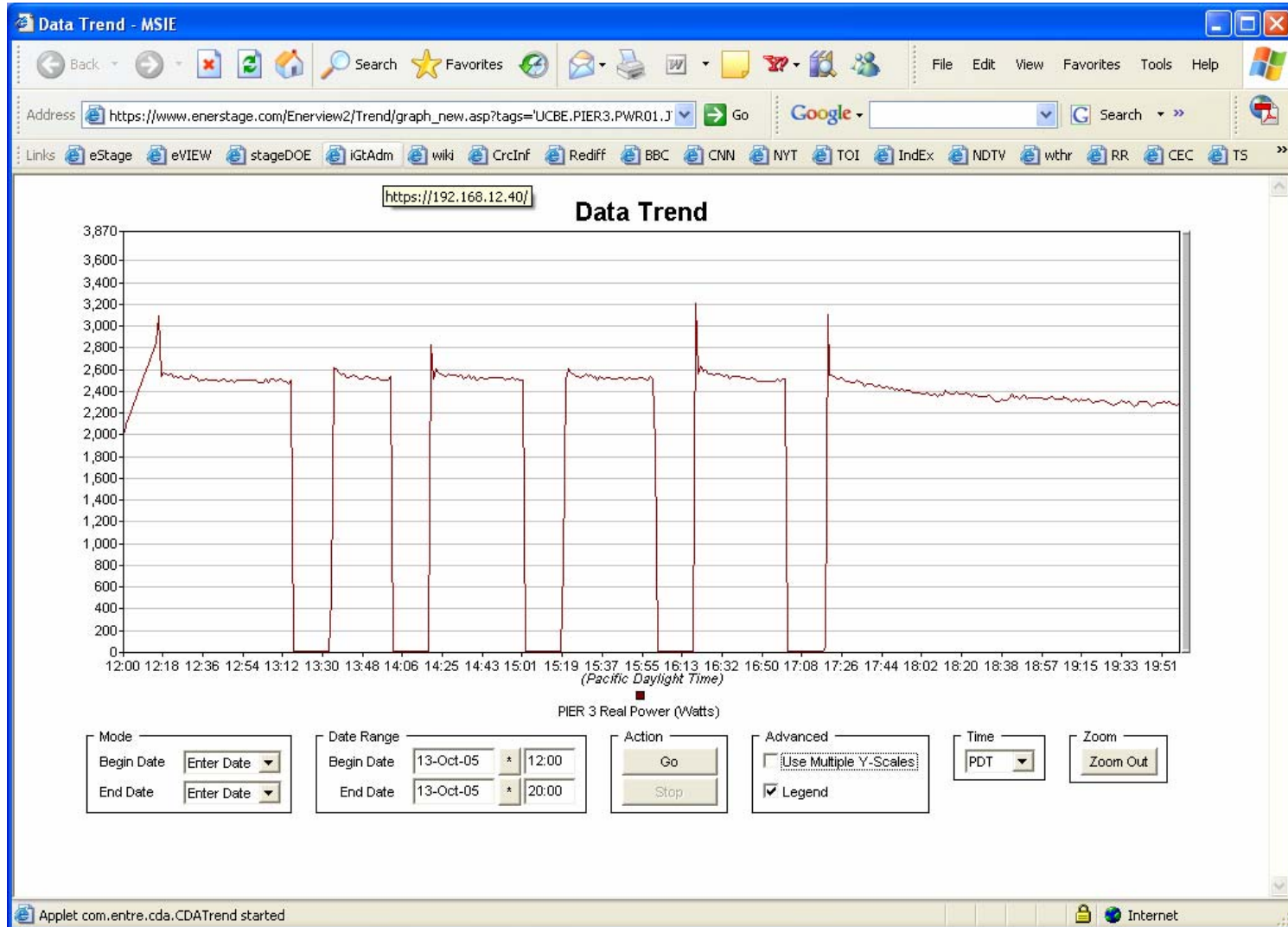
Current Status



- ★ Secure web-site provisioned to provide external, visibility of SCE SCADA data on feeder load in real-time (at SCADA scan rate)
- ★ SCE has installed ~300 A/C load control devices (target is 500-600)
- ★ CPUC has approved SCE Advice Letter in order to enable the full range of tests in Summer 2006
- ★ A first, shake-down test of the system was conducted on October 13, 2005



Pilot Test – Oct. 13, 2005





Future Stages

- ★ Demonstrate geographic targeting of load curtailments – determine value for system reliability
- ★ Extend application to other SCE (and CA utility) load management assets
- ★ Demonstrate capability to provide frequency responsive reserves through staged load curtailments
- ★ Review and pilot options w/CA ISO for integration into system operations